illustrate the impetus that work on AAG has given to glycoprotein studies in general.

The book is in four sections which vary in length and approach. The first section deals with the general biochemistry and structure of the glycoprotein through four reviews. A relatively brief but illuminating account of his own work is given by Schmid. This not only reviews the highly successful results of imaginative and meticulous application of developing methods of protein and glycan analysis. It also provides glimpses of the foresight and depth of commitment that enabled Schmid to recognise and pursue the solution of important problems that were unfashionable to his seniors in the '50s. The structure-function relationships of the glycan chains of AAG are then put into context by a thorough and very readable review of the glycans of human plasma glycoproteins in general. These relationships are explored further in an assessment of the significance of glycan microheterogeneity in diseased states. An account then follows of the power of immunochemical approaches to exploring some of these areas.

A section on the genetics of AAG commences with an interesting review of the genomic organisation and expression of several AAG genes. The two following chapters present data bearing on these phenomena. There then follows a dozen or so very brief and varied communications interspersed with longer chapters on drug binding to AAG and its hepatic elimination from the circulation by the asialoglycoprotein receptor. These papers generally make interesting reading and cover a wide range of topics. Surprisingly they appear in the section headed Genetics. Sadly there is very little molecular biology reported.

A relatively short section headed 'Immune Functions of AAG' deals with its relationship to interleukin-1 and with immunochemical analyses of the glycoprotein. This is followed by the largest section of the book concerned mainly with drug-binding properties, reflecting the current applied pharmacological importance of the compound.

On the whole this book is a readable and interesting account of a wide range of studies on AAG. With so many authors variation in depth and standard of presentation is inevitable. There is some imbalance in the treatment and there is little that is very new. However, it draws together a large body of information on this model glycoprotein which will be invaluable for any student of this fascinating group of compounds. The price is probably beyond all but the enthusiast, but in the library it is likely to be well used by practitioners from a wide range of life sciences.

Frank Hemming

Hemoglobin Switching; Edited by G. Stamatoyannopoulos and A.W. Nienhuis; Alan R. Liss; New York, 1989; Part A, xxvi + 378 pages; part B, xxiv + 468 pages; $120.00 each

This two-volume work represents the proceedings of the Sixth 'Haemoglobin Switching Conference', held in Arlie House, Virginia, in September 1988. For the uninitiated, haemoglobin switching is shorthand for a characteristic developmental phenomenon taking place in most vertebrates, whereby at successive stages of ontogenesis different but related genes are responsible in turn for the bulk of haemoglobin synthesis. In humans, the greatest focus of interest has been on the γ to β switch, whereby in fetal life most of the haemoglobin is F ($\alpha_2\gamma_2$), and after birth most of the haemoglobin is A ($\alpha_2\beta_2$). From the point of view of molecular biology, a strong incentive to understanding the switch has been its perception as a model of how genes are turned on and off; from the point of view of clinical haematology, influencing the switch has been a dream-approach to treatment of haemoglobinopathies.

These two books contain a total of 64 papers, plus a final overview by David Nathan, who met with great spirit the real challenge of summarizing not only this symposium, but also the previous five held on the same topic since 1978. In his discussion, enlived by a wealth of personal recollections, he manages to identify the continuing research threads through the decade which started with the cloning of the globin genes and finished with the identification of several critical control regions in the β-globin gene cluster.

I must admit to being prejudiced against symposia proceedings (perhaps betraying a feeling of guilt for not always bringing the expected camera-ready manuscript to meetings!). As a rule, they are fragmentary, and the material is repetitious of papers already published or soon to be published in accredited journals. This work is an outstanding exception to the rule. Because the topic is so specific, and practically every lab working on it is well represented, the two volumes give an impressive, detailed and authoritative account of the haemoglobin switch.

If it took Nathan about 30 pages to do his summary, I could certainly not presume to do it in one. One volume (part A) deals with *Transcriptional Regulation*, the other (part B) with *Cellular and Molecular Mechanisms*. Inevitably, the distinction between transcriptional regulation of γ-globin genes and the molecular mechanism of the switch is rather blurred, but the reader is helped by the further grouping of papers into various sections, ranging from transcriptional control of individual globin genes, to comparative molecular genetics, to 'chromatin and nuclear matrix', to the genetics and phenogenetics of hereditary persistence of fetal haemoglobin (HPFH). Part B acquires its identity through the papers on cell lines, on HPFH mutants and on the clinical implications of attempting to tamper with the switch, especially in sickle cell anaemia. Indeed, as much as the use in these patients of cytotoxic agents, like azacytidine and hydroxyurea, might have appeared drastic and is potentially dangerous, one is impressed by the fact that the ploy actually works, at least to the extent that substantial increases in HbF levels are seen in a substantial proportion of patients (whether this will become standard treatment remains to be seen).

The problem of the haemoglobin switch was posed since the early sixties and C. Baglioni (Molecular Genetics, H.C. Taylor, Ed., Academic Press, 1963) had already suggested that in normal adults haemoglobin F synthesis was influenced

by the rate of erythropoietic activity in the bone marrow. A critical view of the progress made in nearly 30 years might be that the switch has still not been cracked: but such a simplistic statement would be misleading. In fact, it has become quite clear that the regulatory events responsible for the phenomenal transcriptional activity of genes within the β-globin cluster in erythroid cells are distinct from the regulatory events that determine *which* genes within the cluster are predominantly expressed. The element responsible for the former phenomenon is the so-called *cis*-dominant region identified by F. Grosveld's group upstream of the embryonic (ϵ) gene; the elements responsible for the γ to β switch are still elusive, although regions within the second intron and 3′ to the third exon seem to be good candidates. The role of *trans*-acting factors, compellingly supported by genetic and cellular studies, is only beginning to be clarified.

Haemoglobin Switching could be subtitled 'everything you want to know about the switch and more'. As such it can be recommended wholeheartedly to all those working on haemoglobin or in developmental biology: it is a must for anybody involved in both. In spite of the usual one-year gap between the conference and the publication, it is still remarkably up-to-date. I don't know how much editing George Stamatoyannopoulos and Arthur Nienhuis have had a chance to do on the manuscripts, since the attractive production is a good example of complementation between photo-offsetting and mostly immaculate word-processor printouts. My impression is that they have been masters of 'upstream editing', which they have done by selecting the speakers-authors. I suspect and hope they are already applying the same skill to organising the next conference, 'Haemoglobin Switching in the Nineties'.

Lucio Luzzatto

Glutathione: Chemical, Biochemical and Medical Aspects (Coenzymes and Cofactors, vol. 3); Edited by D. Dolphin, R. Poulson and O. Avramovic; Wiley Interscience; New York, 1989; Part A, xiv + 930 pages, £88.15; Part B, xvi + 848 pages; £96.85

This pair of volumes is the third in a series on coenzymes and cofactors; Vol. 1 (parts A and B) covered vitamin B6 and Vol. 2 (parts A and B) the pyridine (sic) nucleotide coenzymes. The editors obviously intend to fill a considerable length of library shelving by the time they have finished with all the coenzymes. I remain to be convinced that this is a useful exercise, or that such volumes serve a more useful purpose than brief critical reviews on selected aspects (which could be published more rapidly, and hence be more up to date), followed by spending the balance of the purchase price on a computer search of the current literature.

This is a multi-author work, and obviously there are differences in the quality of different chapters. The chapter on glutathione in ocular tissue includes an excellent succinct summary of the structure and function of the lens and its development. As an example of the sort of irrelevant information I delight in collecting, I had not realised that the centre of my lens contains cells which are as old as I am (in fact, older, since they developed ante-natally) – and old lens cells never die. By contrast, I searched the chapter on leukotriene C biosynthesis for the structure of a compound I was regrettably unable to recall – to find it, eventually, hidden among 12 compounds in a single small diagram. Perhaps it is the age of the cells at the centre of my lens which renders such diagrams less than satisfactory!

The standard, quality and style of diagrams vary widely between chapters, suggesting that art-work provided by authors was used directly. While this does help to keep the price down, it also results in a very uneven appearance of the finished volumes. Where diagrams have been reproduced directly from primary research publications, this shows in very poor quality. In some chapters the diagrams are conventionally captioned, while in others it is difficult to work out what the diagrams are meant to convey – they are inserted in the text with no captions.

Each chapter has an extensive bibliography, with several hundred references cited – unfortunately without titles, so it is difficult to know whether a given paper is likely to reward a visit to the library or not. The references are cited by number, which occasionally leads to the rather inelegant practice of a number followed by a, b, etc. – and not always where relatively recent references have been inserted in proof. The most recent I found was 1986!

The most serious criticism of this book must be that there is more overlap between chapters than is reasonable, even in a multi-author work. It becomes annoying to read the same introductory matter several times over, but more seriously, different authors have used the term 'glutathione' with different meanings – as either 'total glutathione' (= GSH + GSSG) or as 'reduced glutathione (GSH) – despite comments on nomenclature from Meister in his opening Chapter. The editors must be taken to task for failure to edit the work into a consistent style.

David A. Bender

Sixteenth Symposium on Nucleic Acids Chemistry (Nucleic Acids Symposium Series No. 21); Organized by H. Takaku; IRL Press; Oxford, 1989; viii + 142 pages; £30.00

This small book is made up of two page abstract papers presented at the Sixteenth Symposium on Nucleic Acids Chemistry which was organised by Professor Hiroshi Takaku and which was held at Narashino, Japan between 5th and 7th